# MINERAL RESOURCE POTENTIAL AND GEOLOGIC MAP OF THE LITTLE DOG AND PUP CANYONS ROADLESS AREA, OTERO COUNTY, NEW MEXICO

SCALE 1:50 000

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3 KILOMETERS

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MISCELLANEOUS FIELD STUDIES MAP MF-1468 PAMPHLET ACCOMPANIES MAP

rangles and the Gowdy Ranch and Panama Ranch 7 1/2 minute quadrangles. A mineral-resource survey was made of the area in 1979 by the U.S. Geological Survey and the U.S. Bureau of Mines. This study, based on geologic, geochemical, and geophysical investigations, indicates that the potential for metallic or nonmetallic mineral deposits is very low but that some potential exists for the occurrence of oil and (or) natural gas. An airborne magnetometer survey was made of the area and its immediate surroundings, and spectrographic analyses were made of 31 alluvial-sediment samples (fig. 2). There are no recorded mining claims in the area, and no oil or gas exploratory holes have been drilled within the area.

### GEOLOGY

Rocks

The following description of the geology is based on fieldwork done in 1979 and on a report by Hayes (1964) covering the southern part of the study area. The Little Dog and Pup Canyons Roadless Area is underlain by Permian strata that have been disrupted by many north- to northwest-trending high-angle faults. The faults are related to the uplift of the Guadalupe Mountains. The Yeso Formation, at the base of the sequence, is made up of interbedded dolomite, gypsum, and siltstone. The San Andres Limestone, which overlies the Yeso and underlies most of the study area, is composed almost entirely of dolomite and dolomitic limestone. The upper unit, the Grayburg Formation, crops out only near the southeast corner of the study area and is composed of dolomite and subordinate sandstone.

#### Structure

The Little Dog and Pup Canyons Roadless Area is along the north- to northwest-trending faulted front of the Guadalupe Mountains, which in a general way can be described as a faulted monocline. The uplifted Guadalupe Mountain block, east of the fault zone, dips 10-20 eastward.

The principal faults are roughly en echelon in nature; the eastern faults die out northward, and the western faults die out southward. The faults have stratigraphic displacements of a few tens to many hundreds of feet. All of the larger faults and several small faults have displacements that are relatively down on the west or southwest, but several faults, some of considerable length, have displacements that are relatively down on the east or northeast. Many of the faults are marked on the ground surface by gentle topographic swales, and observations in the region to the south and west of the study area indicate that these swales are weathered on clayey gouge zones as much as 33 ft (10 m) thick. Such thick gouge zones are not present on all the faults, but the zones are significant in that they are probably nearly impervious to migrating fluids.

#### AEROMAGNETIC SURVEY

An aeromagnetic survey of the area was flown 500 ft (150 m) above the ground along east-west flight lines spaced 1 mi (1.6 m) apart. According to L. E. Cordell (written commun., Sept. 22, 1980), "Aeromagnetic contour patterns indicate sources wholly within Precambrian crystalline basement rocks, about 1,500-3,500 ft (450-1,065 m) below the sensor. Narrow highamplitude anomalies indicative of shallow igneous intrusive rock were not observed. Nor is there any obvious aeromagnetic expression of structural trends or intersection of trends within the study area."

### ASSESSMENT OF MINERAL RESOURCE POTENTIAL

### Base and precious metals

No visible signs of base- or precious-metal mineralization or hydrothermal alteration were noted during this investigation, and there are no mineral claims in the Little Dog and Pup Canyons Roadless Area. As a part of this investigation, 31 alluvialsediment samples were collected from drainage courses that drain the study area. Semiquantitative spectrographic analysis of the samples showed no anomalous metal values. On the basis of these geochemical results, the failure to detect any visible signs of mineralized rock, the absence of magnetic evidence for shallow igneous intrusives, and the general lack of mineralized rock in the Guadalupe Mountains, it is deemed highly improbable that any metallic mineral deposits underlie the study area.

# Oil and gas

Oil and (or) gas may underlie the study area, but the probability is small. Presently, the closest production is from a series of gas wells about 12.4 mi (20 km) northeast of the study area. These wells, which produce primarily from rocks of Pennsylvanian age, are all northeast of the northeast margin of the Guadalupe Mountains. On the basis of past drilling on both sides of the northeast margin of the present mountains, that margin reflects the edge of an ancient positive area on which Pennsylvanian rocks are relatively thin or absent to the southwest. Of the more than 20 test holes that have been drilled in the Guadalupe Mountains southwest of that margin, all have been nonproductive. One of these test holes, the Tri-Service Drilling Co. 1 Little Dog-Federal, was drilled just outside the study area in NE 1/4 sec. 6, T. 22 S., R. 19 E. (fig. 2). Three other dry holes have been drilled within 3 mi (5 km) of the study area.

At least 3,300 ft (1,000 m) and possibly as much as 5,000 ft (1,500 m) of sedimentary rock lie between the base of the San Andres Limestone and the Precambrian basement rocks, and several zones within these sedimentary rocks have proven to be productive of oil and (or) gas east of the Guadalupe Mountains in southeastern New Mexico. The gouge zones that occur along many of the faults in the study area could easily serve as impervious barriers to oil or gas migration and might serve as traps for hydrocarbons, especially in areas where the rock layers dip away from the faults. Thus, a reasonable case could be made for test drilling in the study area, especially near The Rim throughout the length of the study area. However, the chances of finding a productive reservoir in a single test are estimated to be less than 1 in 10.

# Nonmetalliferous deposits

Deposits of dolomite, gypsum, and gravel are present in the study area. However, large amounts of a better quality of these materials are abundant elsewhere in more accessible areas in the region.

# REFERENCES CITED

Hayes, P. T., 1964, Geology of the Guadalupe Mountains, New Mexico: U.S. Geological Survey Professional Paper 446, 69 p. Kelley, V. C., 1971, Geology of the Pecos country, southeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 24, 75 p.